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ABSTRACT

This volume is one of a four-volume final report of a research project developed to identify the jobs and training needs for the area of wastewater land treatment systems and related agricultural occupations. The overall purpose of the project is presented in terms of its six subobjectives: (1) To identify the agricultural occupations related to the Muskegon County Wastewater Management System (MCWMS) and determine job needs, (2) to perform a task analysis on each of the identified agricultural occupations related to the MCWMS, (3) to write student terminal performance objectives and develop modules of instruction, (4) to explore the possibilities of utilizing the MCWMS as an educational tool, (5) to develop student awareness information, and (6) to implement an articulated curriculum with actual programs. Overall findings presented showed that nationwide employment of individuals working in conventional wastewater treatment systems as well as modern systems is expected to rise rapidly through the mid-1980's and that there is a need for student modules of instruction for the agricultural occupations. Appendixes constitute the majority of the document. Major appendixes are titled Task Analysis Survey Instruments, Selected Pages (9 pages), A Sample of the Format Used for Writing Student Terminal Performance Objectives and Instructional Modules (12 pages), An Explanation of the Components in the Instructional Modules (2 pages), Bibliography of Documents Reviewed and Used for the Project (11 pages), Survey Question and Results Concerning Using the MCWMS as an Educational Tool (5 pages), and A Discussion of Possibilities and Approaches for Implementing Vocational and Technical Agricultural Programs in Career Education Banning District #21 (14 pages). (SH)

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FINAL REPORT

VOLUME I OF IV VOLUMES - AN OVERVIEW OF THE RESEARCH PROJECT

PROJECT NO. VO218VZ
GRANT NO. OEG-O-74-1669

A STUDY OF JOB DEMANDS AND CURRICULUM DEVELOPMENT IN AGRICULTURAL TRAINING RELATED TO THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM

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JANUARY, 1976

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PREFACE

This volume is one of four volumes prepared by staff in the Vocational Education Department, Muskegon Area Intermediate School District, as a part of the research project entitled, "A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System." The project was funded under a contract with the Bureau of Occupational and Adult Education, U.S. Office of Education. The final Report consists of the following volumes:

Volume I:	An Overview of the Research Project
Volume II:	Task Analysis Results
Volume III:	Student Terminal Performance Objectives and Instructional Modules
Volume IV:	Career Awareness Information

Citizens in Muskegon County, Michigan were fortunate in the late 1960's to receive federal, state and local dollars for the construction of a 40+ million dollar "Demonstration" wastewater treatment system. It was the opinion of many concerned individuals that a wastewater land treatment system would stimulate the Muskegon economy and restore lakes, streams, and rivers to a condition of purity most Americans had almost given up the hope of achieving. The research project grew out of the need to identify the jobs and training needs of individuals desiring to work in wastewater land treatment systems and related agricultural occupations. It was anticipated that hundreds of new agricultural related jobs would emerge in the region as a result of the Muskegon farm irrigation system.

The purposes of this project were: (1) To identify job needs for agricultural occupations which will result from the Muskegon County Wastewater Management System and perform a task analysis on each occupation; (2) To develop instructional modules and determine their place in either high school or two-year college programs; and (3) Implement an articulated curriculum with actual programs and gain approval for funding.

ACKNOWLEDGEMENTS

Since the inception of the project, many persons have made significant contributions to the development of the materials included in the final report. Appreciation is expressed to Jack A. Wilson, Project Officer, Research Branch, Division of Research and Demonstration, Bureau of Occupational and Adult Education, U.S. Office of Education, for his direction during the preparation of this information. Gratitude is also expressed to the many local, state, and national agency representatives and industries who have given invaluable assistance in this project.

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Lansing, Michigan

Michigan Employment Security Commission
Lansing, Michigan

Muskegon County Agricultural Extension Service
Muskegon, Michigan

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Muskegon, Michigan

Muskegon County Department of Public Works Board
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INTRODUCTION

Problem Area Toward Which the Project was Directed

Finding effective means for treating domestic and industrial wastewater has been a national and international problem over the years. The United States Environmental Protection Agency, the State of Michigan and the local people in Muskegon County initially invested 40+ million dollars to construct a "demonstration" wastewater land treatment system to restore lakes, streams, and rivers to a condition of purity most Americans had almost given up the hope of achieving. On February 28, 1973, this 11,000 acre wastewater management system was selected as one of the top ten engineering achievements of 1972 by the National Society of Professional Engineers.

On October 18, 1972, Public Law 92-500 (P.L. 92-500) titled, "The Federal Water Pollution Control Act Amendments of 1972" was issued by the 92nd Congress. The act established as a national goal the elimination of the discharge of pollutants into the nation's waters by 1985. The Muskegon County Wastewater Management System was constructed in Muskegon County to eliminate water pollution problems in the area and to stimulate the Muskegon economy. As of spring 1975, public and private agencies were waiting for the data to come out of the Muskegon project in order to determine the feasibility of constructing similar projects for alternative or supplemental purposes. Environmental Protection Agency Administrator Russel E. Train publicly endorsed the land treatment approach for adequately treating wastewater in late April, 1975. Because land treatment is considered the best practical approach to treating wastewater, it is reasonable to state that there are going to be similar systems constructed throughout the State of Michigan and the nation in years to come. When the proposal for this project was submitted, no significant data on the creation of jobs, training needs, or the impact on agricultural production was available as a result of constructing and operating a comprehensive land treatment system. It was anticipated that hundreds of new agriculture related jobs would emerge in the region as a result of the County's 11,000 acre wastewater system. It has over 5,000 acres of irrigated crop land and is the largest farm as well as the largest corn producer in the State of Michigan.

Goals and Objectives of the Project

The major purpose of this project was to identify job needs and develop a model educational program for training individuals to work in agricultural occupations related to the Muskegon County Wastewater Management System. It was further proposed that the 14 secondary schools in the area and Muskegon Community College would find a means of utilizing this modern and unique County owned farm irrigation system as a laboratory for training in vocational agriculture and environmental technology.

The proposal stated that the project would carry out the following primary objectives:

1. Identify job needs for agricultural occupations which will result from the Muskegon County Wastewater Management System and perform a task analysis on each occupation.

2. Develop instructional modules and determine their place in either high school or two-year college programs.

3. Implement an articulated curriculum with actual programs and gain approval for funding.

Because of the quantity of information developed by the staff, the final report consists of four (4) volumes. This volume (Volume I) of the final report includes a summary of the procedures and accomplishments relative to each volume. Also included in this volume are general findings and recommendations. The reader will be asked to refer to the Appendix of this volume for specific information in regard to the volumes prepared.

PROJECT PROCEDURES AND ACCOMPLISHMENTS

The information presented in this section of the volume will be discussed in terms of project sub-objectives.

An invaluable element traditionally used to assist in researching, planning, implementing and evaluating educational programs has been a working advisory committee. An advisory committee representing local, state, and federal agencies from the public as well as the private sector was organized early in the project. Three group advisory committee meetings were held. In addition to group meetings, a majority of the advisory committee members were used individually or in small groups to assist the research staff in completing various stages in the project. A list of the individuals who served as advisory committee members are listed at the beginning of this report under acknowledgements.

Sub-Objective One

--To identify the agricultural occupations related to the Muskegon County Wastewater Management System and determine job needs.

With the assistance of county employees working on the site, the staff identified the following agricultural occupations on the site:

a. Wastewater Treatment Operator
b. Wastewater Treatment Laboratory Technician
c. Agricultural Equipment Mechanic
d. Farm Equipment Operator
e. Farm Manager
f. Field Supervisor

g. Irrigator
h. Grain Drier Operator

Employment Outlook for Agricultural Occupations Represented at the Muskegon County Wastewater Management System

Because of Public Law 92-500 and other factors, there should be varying employment demands for skilled and technical individuals to fill the types of occupational positions under study. New wastewater treatment plants will have to be constructed or upgraded in many local communities to meet the 1985 water pollution standards. There should be a greater demand for wastewater treatment operators and laboratory technicians in years to come. Walters (1974, P. 9) has projected that the total employment of persons working in Michigan's municipal wastewater treatment plants will increase to an additional 27.9 percent from the end of 1972 to the end of 1976 if construction of new plants and plant upgrades continues as expected. One-third of the employees will probably be in the operator classification and many will perform maintenance and laboratory duties. One could also predict that because of P.L. 92-500, there should be a greater demand for wastewater treatment operators and laboratory technicians on the national level in the future. This prediction is supported by the Bureau of Labor Statistics for the Bureau states:

> "Employment . . . is expected to rise rapidly through the mid-1980's mainly as a result of the construction of new treatment plants to process the increasing amount of domestic and industrial wastewater. Also, more highly trained operators will be needed as existing plants expand and modernize their facilities to cope more efficiently with water pollution. In addition to the new jobs from employment growth, many job openings will occur as experienced operators retire, die, or transfer to other occupations." (1974, P. 2).

In a recent study conducted by the Agricultural and Natural Resources Education Institute at Michigan State University for the Michigan Department of Education, the authors revealed that 597 workers were needed by Michigan's Farm Machinery Dealers Association in late 1974. The normal replacement rate for Michigan's Farm Machinery Dealers Association was 283 per year for an annual turnover rate of 14.2 percent. (Thuemmel, Discussion Report, 1975).

Future national demands for agricultural equipment mechanics does not appear to be as attractive as the future national demands for wastewater treatment operators and laboratory technicians. The Bureau of Labor Statistics reveals:

> "Employment of farm equipment mechanics is expected to increase slowly throughout the mid-1980's. In addition to jobs from employment growth, several openings will arise each year as experienced mechanics retire, die or transfer to other occupations." (1974, P 2).

Treating wastewater by means of land treatment received much publicity in 1975. The federal support of the Muskegon County Wastewater Management System and the endorsement by Mr. Train could possibly mean that there are going to be more land treatment systems constructed nationally in the future. This method of treating wastewater should increase the demand for more specialized agricultural equipment mechanics.

For some years now, American farms have decreased in number and increased in size. The production of farms has also increased. Because of new technology found in many American farms, managers and supervisors have also decreased over the years. This trend will continue in the future as the number of U.S. farms decrease.

With anticipation that land treatment will be used in the future to adequately treat domestic and industrial waste, there should be an increasing demand for farm managers and field supervisors, particularly for grain production farming operations.

With an increasing demand to produce more grain crops on large American farms, many farmers are installing spray irrigation systems to increase crop production. The demand for irrigators and grain drying operators should increase rapidly through the mid-1980's. Assuming that land treatment will be an alternative or supplemental system for treating waste in the future, more irrigators and grain drier operators will be needed.

Sub-Objective Two --To perform a task analysis on each of the identified agricultural occupations related to Muskegon County Wastewater Management System

The research team wanted to know what job skills, knowledges, behaviors and basic skills were needed to succeed in the identified agricultural occupations on the site. Jan Danford, Director of Curriculum and Instruction at the Capital Area Career Center in Mason, Michigan, provided the research staff with sample instruments used by the Center in performing task analyses on various occupations. The Capital Area Career Center instrument was revised to meet the needs of the Muskegon Area Intermediate School District (MAISD) research project. Task statements for several agricultural occupations studied were received from Michigan State University, Montana State University, and The Ohio State University. This information assisted the staff in developing some of the needed instruments. Due to the fact that the research team was unable to locate task statements for some of the agricultural occupations studied, personal interviews were conducted by staff to identify the duties of individuals working in the Muskegon County Wastewater Land Treatment System. Instruments were developed for each occupation and field tested. Several revisions were made in order to clarify the wording in the directions for completing the instruments as well as task statements. Appendix A, pages 13 to 22 illustrates the format used to collect data pertaining to job skills, knowledges, behaviors, and basic skills for the eight agricultural occupations studied.

Several instructors of vocational agriculture in the Western part of Michigan were used to assist the project staff in collecting the research data. See Appendix B, Page 23 to 24 for names and addresses of vocational agriculture teachers who assisted in the data collection phase of the project. All data collectors participated in a training session designed to equip one with the necessary basic skills for collecting field data. See Appendix C, pages 25 to 28 for information used in training data collectors. Task analysis results for each occupation studied can be found in VOLUME II - TASK ANALYSIS RESULTS.

Sub-Objective Three --To write student terminal performance objectives and develop modules of instruction

A third sub-objective of this project was to write student terminal performance objectives and develop instructional modules. The research staff used computer results as a means for writing modules. In the early 1970's, the Michigan Department of Education developed student performance objectives for every vocational program offered in Michigan public schools. The format used by the Vocational and Career Development Service in writing student performance objectives was adopted for preparing performance objectives for the MAISD research project. This format is shown in Appendix D, page 30. Student terminal performance objectives written by the staff outline specifically: (a) The conditions under which the student will perform; (b) What the student will do as a result of the instructional module; and (c) How well the student will perform. Student terminal performance objectives were reviewed by a teacher educator, instructors of vocational agriculture, and several community college instructors who taught environmental chemistry, field biology, ecology, and welding. Comments received from reviewers were considered by the staff in revising this material. See Appendix E, pages 42 to 43 for a listing of reviewers. A complete set of student terminal performance objectives for each occupation can be examined in VOLUME III - STUDENT TERMINAL PERFORMANCE OBJECTIVES AND INSTRUCTIONAL MODULES.

The research staff was confronted with the task of designing a delivery system for developing instructional modules. The format for writing instructional modules was developed by the staff and reviewed by several individuals who are knowledgeable in curriculum development. We are of the opinion that the instructional strategy developed will be accepted by instructors at the high school and community college levels. The instructional strategy was designed to provide enough flexibility so that each individual user could adopt materials appropriate to his/her own style and situation. The format was also designed so that when certain skills and knowledges become obsolete, this material can be deleted and new information incorporated. An explanation of the elements included in the modules are shown in Appendix F, pages 44 and 46.

Several public and private agencies supplied the staff with technical information. See Appendix G, page 47 to 50 for a listing of the industries and agencies who provided the staff with materials related to this project. A bibliography of documents reviewed and used for the project can be examined in Appendix H, page 51 to 62. With the use of this excellent information, instructional modules were written for some of the occupations studied. Modules were reviewed by several experts. The module review form is found in Appendix I, beginning on page 63. A sample module is shown in Appendix D, pages 31 to 41. Other instructional modules developed by the staff are found in VOLUME III - STUDENT TERMINAL PERFORMANCE OBJECTIVES AND INSTRUCTIONAL MODULES.

Sub-Objective Four --To explore the possibilities of utilizing the Muskegon County Wastewater Management System as an educational tool.

The research team selected influential people in Muskegon County in order to identify the possibilities of utilizing the Muskegon County Wastewater Management System to enhance the learning of youth and adults. Comments and questions obtained from the interviewees were summarized. The research staff explored possibilities with several local and state controlling agencies to determine whether the site can be used for educational purposes, and if so, to what extent. The type of individuals surveyed follows:

Occupations/Positions	Number Surveyed
Superintendent of Public Schools	1
Assistant Superintendent of Public Schools	1
Board of Education Member	1
Vocational Agriculture Teachers	3
County Extension Personnel	3
Community College Administrator	1
State Department of Education Representative	1
Department of Natural Resources Administrator	1
Former County Commissioner	1
County Commissioner	1
County Administrator	1
Muskegon County Wastewater Management System Personnel	2
	Total 17

The survey questions and findings are found in Appendix J beginning on page 67. The survey was conducted in one-to-one-interviews. The following is a summary of the perceptions of the individuals surveyed regarding the utilization of the system:

1. With only three high schools in Muskegon and Oceana Counties providing opportunity for vocational agriculture training, it was almost an unanimous opinion that more programs were needed for all

schools. Suggestions to enlarge included use of the Muskegon County Wastewater Management System as a location for new programs, (i.e. ornamental horticulture, production agriculture, agriculture mechanics and natural resources). Field trips for all ages were also highly encouraged.

2. There was general concurrence that the Muskegon County Wastewater Management System site should be utilized as a national center for seminars, training and information dissemination of the operation of wastewater land treatment systems.

3. There was a general agreement that the Muskegon County Wastewater Management System should be used as an outdoor laboratory for classroom teachers, (i.e., field trips, land surveying, 1920 farm scene with house and barn furnished and stocked as a 1920 farm).

4. There was a strong support for a visitor's center and the suggestion was made that Muskegon Community College students interested in "People Contact" oriented job experiences could operate the center.

5. General agreement was toward making an educational area available to 4-H, Boy and Girl Scouts and other organizations interested in ecology, agriculture or conservation.

6. Educational ventures should include wildlife management, recreation and tourism.

7. There was mixed support, but enough to warrant investigation of the development of community gardens on the site.

8. There was strong support to build facilities on the site for use in vocational-technical agriculture programs by high schools and the community college. Some suggested beginning by using existing barns and houses on the site.

9. Other suggestions included:

   a. Educational involvement in public relations
   b. Controlling hunting
   c. Experimentation and research center
   d. Emphasized coordination and cooperation

Sub-Objective Five --To develop student awareness information

In order to provide students with an awareness of the Agricultural Industry and the many occupations available as a career, the staff, with the assistance of consultants, developed

two (2) filmstrips with narration on cassette tapes. One filmstrip entitled, "PREPARING FOR A CAREER IN AN EXPANDING INDUSTRY - AGRICULTURE," includes the following: (a) The purpose of agricultural education programs; (b) The type of education institutions in which one could receive training in agriculture; (c) The type of teaching methods used to prepare students for agricultural careers; (d) The Future Farmers of America youth organization; and (e) A description of several occupations in the Agricultural Industry.

A second filmstrip entitled, "THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM - A SYSTEM DESIGNED TO TREAT DOMESTIC AND INDUSTRIAL WASTE NOW AND FOR THE FUTURE," depicts the following: (a) The planning, development, and construction of the project; (b) How the system operates; and (c) A listing of agricultural occupations found in the Muskegon County Wastewater Management System and the duties of individuals studied. The content of the two filmstrips can be found in VOLUME IV - CAREER AWARENESS INFORMATION.

Copies of the two filmstrips and cassette tape may be obtained by writing to the Superintendent, Muskegon Area Intermediate School District, 630 Harvey Street, Muskegon, Michigan 49442.

Sub-Objective Six --To implement an articulated curriculum with actual programs and gain approval for funding.

In order to determine the vocational interest (students were asked to select two course offerings) of approximately 6,000 tenth and eleventh grade students in Career Education Planning District (CEPD) #21 which consist of fourteen school districts, a survey was conducted in the Fall, 1974 by the Vocational Education Department in the MAISD organization. The results of the survey are shown below:

First Choice

Agriculture		
Production	121	
Supplies	14	
Mechanics	24	
Products	29	
Ornamental Horticulture	66	
Total	254	4%

Second Choice

Agriculture		
Production	96	
Supplies	34	
Mechanics	28	
Products	36	
Ornamental Horticulture	84	
Total	278	5%

The MSU study of projected needs (Thuemmel Report) shown below is interesting to compare with the student interest findings of the MAISD survey:

Agriculture	1974-79/Year Required*	Being Trained*
Production	1600	1040
Supplies	760	90
Mechanics	520	220
Ornamental Horticulture	1790	231

(* These figures have been rounded off)

As of December, 1975 vocational agricultural programs were located at Montague, Shelby and Ravenna, Michigan in CEPD #21. Due to the location of those three programs, many students in CEPD #21 were unable to enroll in vocational agricultural programs. One objective of this project was to identify ways in which more specialized vocational agricultural programs could be implemented in CEPD #21. The staff met with several groups for the purpose of generating ideas concerning implementing programs. An idea sheet is attached as Appendix K. The staff discussed this issue with the following agency representatives:

Michigan Department of Education
Michigan State University
Muskegon Area Intermediate School District Board of Education
Muskegon Community College
Muskegon County Board of Commissioners
Muskegon County Department of Public Works Board
Muskegon County Metropolitan Planning Commission
West Michigan Shoreline Regional Development Commission

The following locations were mentioned in regard to the implementation of new specialized vocational agricultural programs in CEPD #21:

1. The Wastewater Site

2. Buildings which may not be needed by the schools in the future because of declining enrollments

3. Muskegon Community College

Prepared notes for a meeting between Muskegon Community College, Michigan Department of Education, Michigan State University and Muskegon Area Intermediate School District are found in Appendix L. The discussion centered around implementing vocational and technical programs in CEPD #21. A proposal that was presented to the Muskegon County Board of Public Works is attached as Appendix M.

General Findings

An analysis of data and information received from various individuals and groups revealed the following:

1. Nationwide employment of individuals working in conventional wastewater treatment systems as well as modern systems (e.g. land treatment systems) is expected to rise rapidly through the mid-1980's. Total employment of persons working in Michigan's municipal wastewater treatment plants will increase to an additional 27.9 percent from the end of 1972 to the end of 1976 provided construction of new plants and plant upgrades continue as expected. One-third of the employees will probably be in the operator classification and many will perform maintenance and laboratory duties.

2. Present predictions regarding the national employment of farm equipment mechanics reveals a slow increase throughout the mid-1980's. Treating liquid waste by means of land treatment should increase the demand for more specialized agricultural equipment mechanics.

3. Five-hundred and ninety-seven workers were needed by Michigan's Farm Machinery Dealers Association in late 1974. The normal replacement rate for the Association is projected to be 283 per year for an annual turnover rate of 14.2 percent.

4. American farms will continue to decrease in number and increase in size to some extent in the future. Technology will play an important role in producing agricultural commodities in other parts of the world. The need for skilled, technical, and professional individuals in agriculture is expected to increase throughout the mid-1980's. Opportunities should be available in the following occupations: (a) Farm Manager; (b) Field Supervisor; (c) Grain Drier Operator; (d) Irrigator (sprinkler systems); and (e) Farm Equipment Operator.

5. Analyses of job tasks resulted in the identification and validation of several hundred competencies (job skills and knowledges) needed to succeed in each of the eight agricultural occupations studied. The responses of individuals in the same occupations varied to some extent. There was much commonality between the respondents in the eight occupations relative to basic skills and behaviors needed for successful employment.

6. The format for writing student terminal performance objectives and instructional modules was perceived by instructors of vocational agriculture and Community College instructors as an appropriate strategy for improving instruction.

7. There is a need for more specialized vocational agricultural programs at the secondary level in Career Education Planning District (CEPD) #21
Programs to be emphasized:

    1. Production Agriculture
    2. Ornamental Horticulture
    3. Agricultural Supplies and Services
    4. Agricultural Mechanics

    The following locations were mentioned in regard to this need:

    a. The Wastewater Site
    b. Use buildings which may not be needed by the schools in the future because of declining enrollments
    c. Muskegon Community College

8. There is a need for technical agricultural programs (Post Secondary) in the Greater Muskegon area. Program areas which should be given attention are as follows:

    a. Environmental Protection (i.e. the need to train wastewater treatment operators and laboratory technicians)

    b. Farm Management (An Extension of Agricultural Production)

    c. An Extension of Ornamental Horticulture:

        1. Landscape Design
        2. Turf Management
        3. Soil Management

9. There is a need for student modules of instruction for the agricultural occupations suggested in Number 7 and 8.

RECOMMENDATION

We recommend the development and implementation of educational opportunities that will provide relevant training in Agribusiness, Natural Resources and Environmental Protection (ANREP) for people in CEPD #21. The flow of educational opportunities in ANREP we are proposing is as follows:

K-6 - AWARENESS IN ANREP

7-8(9) - CAREER ORIENTATION IN ANREP

9-10 - CAREER IN ANREP

11-12 - (VOCATIONAL AGRICULTURE) PREPARATION IN ANREP

13-14 (TECHNICAL AGRICULTURE) PREPARATION IN ANREP

Adult Education - UPGRADING AND RE-TRAINING IN ANREP

APPENDIX A

TASK ANALYSIS SURVEY INSTRUMENTS
(SELECTED PAGES ONLY)

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

The Muskegon Area Intermediate School District has received funding for a combined Research and Program Development Project from the United States Department of Health, Education and Welfare. The project entitled, "A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System" is to become a national model educational program for training persons to work in farm irrigation systems similar to the Muskegon County Wastewater Management System. We are asking you to assist the Muskegon Intermediate School District in this needed research project by spending some of your precious time in reacting to this survey. The reason you are being asked to complete this survey is because of your expertise in the profession. In order to develop a relevant and meaningful national model educational program, we need your assistance in identifying the skills, knowledges and behaviors which a worker must possess in order to be proficient on the job.

14

NAME: _____ POSITION: _____

EMPLOYER: _____ TELEPHONE: _____

ADDRESS: _____

(STREET) (CITY) (STATE) (ZIP)

NUMBER OF YEARS EXPERIENCE IN OCCUPATION: _____

DATE: _____

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

DIRECTIONS:

A list of skills which are performed in a given occupation begins on the next page. Please check each item in the skills list indicating answers to the following:

1. Is the skill an entry level skill?

2. How important is it for an individual to know how to perform the skill in order to be proficient for entry level employment?

A list of words and definitions are listed below to assist you in understanding the terminology used in the instruments.

Entry Skill -- The skill was required of you when you first started this position (within the first 60 days).

Not Needed -- Skill does not apply for entry level employment.

Minor Importance -- Proficiency in performing this skill has no effect on entry level employment.

Some Importance -- Proficiency in performing this skill has some influence on entry level employment.

Very Important -- Proficiency in performing this skill has much influence or effect on entry level employment.

Essential -- Of great importance; proficiency in performing this skill is absolutely necessary for entry level employment.

Additional job skills may be listed at the end of this section.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: WASTEWATER TREATMENT OPERATOR 86.1

JOB SKILLS	*ENTRY SKILL YES	*ENTRY SKILL NO	RELATIVE IMPORTANCE: NOT NEEDED	MINOR IMPORTANCE	SOME IMPORTANCE	VERY IMPORTANT	ESSENTIAL	CODE
Treating Waste								
1. Mechanically operate aeration equipment for desired treatment	___	___	___	___	___	___	___	86001
2. Inspecting meters, gauges and test results to determine required treatment	___	___	___	___	___	___	___	86002
3. Monitoring control panels for determining aeration action in waste	___	___	___	___	___	___	___	86003
4. Inspecting aerators	___	___	___	___	___	___	___	86004
5. Inspecting mixers	___	___	___	___	___	___	___	86005
6. Mechanically operating mixers	___	___	___	___	___	___	___	86006
7. Mechanically discharging effluent from aeration cell into settling tank	___	___	___	___	___	___	___	86007
8. Removing, disassembling and repairing aerators	___	___	___	___	___	___	___	86008
9. Reassembling and installing aerators	___	___	___	___	___	___	___	86009
10. Removing, disassembling and repairing mixers	___	___	___	___	___	___	___	86010
11. Reassembling and installing mixers	___	___	___	___	___	___	___	86011
12. Mechanically open and close settling tank gates	___	___	___	___	___	___	___	86012
13. Inspecting gates for obstructions	___	___	___	___	___	___	___	86013
14. Recording amount of effluent in settling tank	___	___	___	___	___	___	___	86014
15. Mechanically operate structures to regulate effluent flow to canals	___	___	___	___	___	___	___	86015

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*It was required of you within the first 60 days on the job.

JOB KNOWLEDGES

DEFINITION: A mental activity; one understanding clearly the job and tasks involved; condition of being aware of something related to the job. In essence, if one knows how to perform a task (practical application), the individual should perhaps know the "theory" as well.

DIRECTION: A list of job knowledges needed in the occupation begins on the next page. Check each item in the knowledges list indicating the relative desirability of the item for your particular job.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: WASTEWATER TREATMENT OPERATOR 86.1

JOB KNOWLEDGES	This Knowledge Is -- UNNECESSARY	DESIRABLE	ESSENTIAL	CODE
MUST UNDERSTAND:				
Treating Waste				
1. Biological processes which occur in the wastewater treatment oxidation cells	___	___	___	86301
2. Basic operating principles of the aeration equipment	___	___	___	86302
3. The effects environmental conditions have on the aeration process	___	___	___	86303
4. Uses of meters and gauges in treating waste	___	___	___	86304
5. How to read meters and gauges	___	___	___	86305
6. The functions of meters and gauges in treating waste	___	___	___	86306
7. The operating principles of the monitoring control panels in treating waste and the importance for operating properly	___	___	___	86307
8. How to check aerators for proper functioning	___	___	___	86308
9. How to complete appropriate forms when checking conditions of aerators	___	___	___	86309
10. How to check mixers for proper functioning	___	___	___	86310
11. How to complete appropriate forms when checking conditions of mixers	___	___	___	86311
12. Basic operating principles of mixing equipment	___	___	___	86312
13. The effects environmental conditions have on the mixing process	___	___	___	86313
14. Basic operating principles of gates in treating and discharging waste	___	___	___	86314
15. Relationship of head and gate opening and flow of waste	___	___	___	86315
16. Biological and physical processes which occur in the settling tanks	___	___	___	86316
17. The importance of selecting and using appropriate tasks for removing, disassembling, repairing, reassembling and installing aerators	___	___	___	86317
18. The importance of using safety practices in removing and installing aerators	___	___	___	86318
19. How to remove, disassemble and repair aerators	___	___	___	86319
20. How to reassemble and install aerators	___	___	___	86320
21. The importance of selecting and using appropriate tools for removing, disassembling, repairing, reassembling and installing mixers	___	___	___	86321
22. The importance of using safety practices in removing and installing mixers	___	___	___	86322

BEHAVIORS

DEFINITION: The manner in which an individual behaves; social conduct, attitudes, personality

DIRECTION: A list of behaviors needed for the occupation begins on the next page. Check each item in the behaviors list indicating the relative desirability of the item for your particular job

Additional behaviors may be listed at the end of this section.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: _____

BEHAVIORS	THIS BEHAVIOR IS -- UNNECESSARY	DESIRABLE	ESSENTIAL	CODE
Exhibits neatness in --				
1. Handling tools and equipment	___	___	___	86601
2. Keeping supplies in order	___	___	___	86602
3. The work area and office	___	___	___	86603
4. Grooming and dressing appropriately for work	___	___	___	86604
5. Setting examples for other employees in terms of working and other personal contacts in the work setting	___	___	___	86605
Shows dependability in --				
6. Completing work on time	___	___	___	86606
7. Arriving to work on time	___	___	___	86607
8. Coming back from "lunch" and "breaks" on time	___	___	___	86608
9. Reporting to the supervisor when there is a need to leave the work area or setting	___	___	___	86609
10. Coming to work regularly	___	___	___	86610
11. Following instructions and carrying out given tasks	___	___	___	86611
12. Reporting to supervisor abnormal situations in the work setting	___	___	___	86612
13. Delegating appropriate responsibility to other employees and making sure the given tasks were performed properly	___	___	___	86613
14. Accepting work setting problem reports and using appropriate supervisory techniques in correcting the problems reported	___	___	___	86614
15. Analyzing personnel problems and using viable supervisory means in solving problems	___	___	___	86615
16. Producing the best quality work	___	___	___	86616
17. Returning promptly all calls	___	___	___	86617
18. Being on time for appointments or calling ahead if detained	___	___	___	86618
19. Accepting and completing jobs assigned	___	___	___	86619
20. Being sure any reports or records are completed	___	___	___	86620
21. Being able to work with minimal supervision	___	___	___	86621
22. Being able to interpret and follow written and verbal directions	___	___	___	86622
23. Properly supervising other employees	___	___	___	86623
24. Anticipating need for and care of tools, equipment and supplies	___	___	___	86624
25. Demonstrating a concern for safety practices	___	___	___	86625

BASIC SKILLS

DEFINITION: The ability to use mathematics, reading, writing communication and any other skills considered necessary in order to begin training toward an occupational goal.

DIRECTIONS: A list of basic skills needed for the occupation begins on the next page. Check each item in the basic skills list indicating the relative desirability of the item for your particular job.

Additional basic skills may be listed at the end of this section.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

CRITICAL INCIDENT ANALYSIS

OCCUPATION: _____

BASIC SKILLS	THIS BASIC SKILL IS -- UNNECESSARY	DESIRABLE	ESSENTIAL	CODE
1. To be able to perform and apply simple mathematical functions: addition, subtraction, multiplication, division	___	___	___	86701
2. To have a basic understanding of algebra	___	___	___	86702
3. To be able to read at a level commensurate with tasks performed	___	___	___	86703
4. To be able to read and comprehend statistical and written data	___	___	___	86704
5. To be able to write words and numbers legibly	___	___	___	86705
6. To have a good command of the English language	___	___	___	86706
7. To be able to perceive color properly. (color blind test)	___	___	___	86707
8. Has dexterity adequate for the job	___	___	___	86708
9. To be able to speak pleasantly and courteously in person and on communication devices	___	___	___	86709
10. To be familiar with rules of grammar, spelling, and punctuation	___	___	___	86710
11. To be able to use alphabetic and numeric systems	___	___	___	86711
12. To be able to practice good safety measures and use first aid when necessary	___	___	___	86712
13. To be able to use necessary hand power tools at a safe and productive level	___	___	___	86713
14. To be able to read and interpret drawings and specifications	___	___	___	86714
15. To be able to make drawings	___	___	___	86715
16. To be able to maintain information and cost records for reporting purposes	___	___	___	86716
17. To be able to manipulate and assemble parts	___	___	___	86717
18. Has a mechanical aptitude that will allow understanding of basic principles	___	___	___	86718
19. Must be able to stand for long periods of time	___	___	___	86719
20. Has no physical impairments, such as serious back problems	___	___	___	86720
21. Must be able to run basic machine tools	___	___	___	86721
22. To have a basic understanding of trigonometry	___	___	___	86722
23. To be able to use tools of electrical trade	___	___	___	86723
24. To understand the use of all common electrical meters and testing devices	___	___	___	86724
25. To be familiar with soldering	___	___	___	86725

APPENDIX B

LIST OF INDIVIDUALS WHO ASSISTED IN DATA COLLECTION

Name	Position/Address
Mr. Philip Carter	Instructor of Vocaticnal Agriculture Shelby High School Shelby, MI
Mr. Keith Griffin	Instructor of Vocational Agriculture Montague High School Montague, MI
Mr. Roger Peacock	Instructor of Vocational Agriculture Coopersville Area Public Schools Coopersville, MI
Mr. Jack Sanderson	Instructor of Vocational Agriculture Fremont High School Fremont, MI
Mr. Walter Weber	Instructor of Vocational Agriculture Ravenna High School Ravenna, MI
Mr. Lee Wever	Instructor of Vocational Agriculture Newaygo County Vocational Center Fremont, MI

APPENDIX C

INFORMATION USED TO TRAIN DATA COLLECTORS

TASK ANALYSIS TRAINING SESSION

The Task Analysis Phase

A. Selection of the agricultural occupations related to the Muskegon County Wastewater Management System to be studied

1. Wastewater Treatment Operator
2. Wastewater Treatment Laboratory Technician
3. Farm Manager (Cash Grain)
4. Field Supervisor (Cash Grain)
5. Farm Equipment Operator (Cash Grain)
6. Grain - Drier
7. Irrigator (Sprinkler System)
8. Agricultural Equipment Mechanic

B. Steps in making the task analysis

1. Collect information from the Muskegon County Wastewater Management System employees relative to specific occupations
2. Review Competence lists and materials developed by Michigan State University and other agencies. (Curriculum Laboratories, State Departments of Education, Private and Public agencies, Colleges and Universities.)
3. Design instruments for data collection
4. Develop instruments for agricultural occupations related to the Muskegon County Wastewater Management System

C. Data Collection

1. Select individuals to assist in collection of data
   a. Curriculum specialist
   b. Vocational Agriculture Instructors
   c. Others
2. The job of the data collector

a. Identify businesses to contact. (Grain Farmers, farm implement repair, etc.)

b. List businesses to cover

c. Contact the operator (owner, manager, foreman, supervisor, or other individuals responsible for operations)

(1) Explain the purpose of the research project and ask for cooperation.

(a) Introductions

(b) "This is a research project conducted by the Muskegon Area Intermediate School District and I have been asked to assist . . . ."

(c) "We want to prepare boys and girls so they will be qualified for a job upon High School or Community College graduation."

(d) "We want our graduates from High School and Community College Programs to accept a job in an organization such as yours, at a level above those filled by those you hire off the street."

(e) "We want to prepare our students for the skills, knowledges and attitudes you expect High School and Community College students to possess when they begin work."

(f) "There are four sections to this questionnaire in which we would like to have you and/or several of your employees to react to and they are job skills, job knowledges, behaviors and basic skills."

(g) "We want you and/or your workers to tell us how important each item really is in order to be proficient on the job."

(h) We want at least _____ to complete the questionnaire. "Can _____ of your employees help us?"

(2) Distribute appropriate questionnaires to workers. (If a worker is a farm equipment operator, the individual should be given the farm equipment operator questionnaire and not the irrigator questionnaire or some other inappropriate questionnaire.)

(a) Explain questionnaire and where checks should be placed. Cover job skills, job knowledges, behaviors and basic skills.

(3) Collect the Critical Incident Lists. Make Sure section to the questionnaire is completed

(4) Return completed Critical Incident Lists to:

Dr. Eddie A. Moore
M.A.I.S.D. Annex
1611 East Oak Street
Muskegon, Michigan 49442

SPECIAL FOOTNOTE:

*In our experience we have found it necessary to follow one of the following procedures:

1. Contact workers either individually or in groups. In group settings or individual interviews, we thoroughly explain the research project and each section in completing questionnaires.

2. We have left the questionnaires with an owner and/or manager. He would administer and collect the questionnaires and we would pick them up on a later visit.

APPENDIX D

A SAMPLE OF THE FORMAT USED FOR WRITING STUDENT TERMINAL PERFORMANCE OBJECTIVES AND INSTRUCTIONAL MODULES

Student Terminal Performance Objectives

Student Terminal Performance Objectives are descriptions of intended outcomes which require the acquisition of certain knowledge and skills. Student terminal performance objectives were written to describe in detail various aspects of the module goal. Several student terminal performance objectives were written so that the student will be capable of performing the module goal effectively. The condition, performance, and criteria were established for each student terminal performance objective. Each student terminal performance objective possesses the following elements:

1. Instructional Areas. Titles and subtitles of instructional areas were written to define the relevant content that should be covered by the instructor.

2. Examples of Supporting References. Examples of supporting references were included in the module to assist the instructor in accomplishing the desired performance of the student.

3. Examples of Student Learning Activities. Examples of student learning activities were written so that the student may become actively involved in various activities that will assist him or her in achieving the student terminal performance objectives.

4. Evaluation Techniques. Suggested evaluation techniques were written to assist the instructor in determining how well the student should perform the student terminal performance objective under specified conditions.

5. Instructional Resources. Instructional materials and/or equipment which are specific to the modules and essential to enhance the learning of students were listed.

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT
VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT PERFORMANCE OBJECTIVES

Occupational Designation: Agricultural Equipment Mechanic

U.S.O.E. CODE NUMBER: 01.0301

MODULE TOPIC	CONDITIONS	PERFORMANCE	CRITERIA
OPERATING OXY-ACETYLENE WELDING EQUIPMENT	1. Provided the appropriate oxy-acetylene welding equipment and pieces of steel or cast iron of various thickness	the student will cut steel or cast iron	well enough that the pieces fit intended purpose as determined by the instructor
	2. Given various types of metals to be welded and the appropriate welding equipment	the student will perform butt and fillet welds in various positions that when the following welding processes are completed a. Welding with steel rods b. Bronze welding c. Welding cast iron d. Hardsurfacing e. Fusion welding without a rod	the metals welded will be of sufficient strength for the required operating conditions as determined by the instructor
	3. Given access to gas welding equipment, accessories and various types of metals to be welded or cut	the student will apply safety practices while performing various types of welds or cuttings	which will prevent injury to the body, other workers or damage to the equipment as determined by the instructor

MODULE OF INSTRUCTION

CODE--01.0301

OPERATING OXY-ACETYLENE WELDING EQUIPMENT

Module Concept: Oxy-acetylene equipment utilizes acetylene and oxygen to produce a flame that melts metal and filler rod which produces a repair in broken or damaged agricultural equipment. The Agricultural Equipment Mechanic must be able to use oxy-acetylene equipment to perform a satisfactory job of welding in order to prevent further damage to agricultural equipment.

The purpose of this module is to depict for the instructor areas which should be taught relative to oxy-acetylene welding to enable the student to effectively and safely operate oxy-acetylene equipment in performing simple welding operations.

Prerequisites: The following modules should be studied before this module is undertaken:

1. Using Safety and Sanitation Practices in Agricultural Equipment Mechanic Shops
2. Selecting, Using and Caring for tools and Equipment used in Agricultural Equipment Mechanic Shops
3. Operating Arc Welding Equipment, especially the instructional area pertinent to identifying common metals used in making minor repairs on agricultural equipment

Module Goal: At the completion of this module, the student will be able to apply basic oxy-acetylene welding skills and knowledges in making minor repairs on agricultural equipment.

Student Performance Objective 1: Provided the appropriate oxy-acetylene welding equipment and pieces of steel or cast iron of various thickness, the student will cut steel or cast iron well enough that the pieces fit intended purpose as determined by the instructor.

Instructional Areas:

1. Setting up the oxy-acetylene welding equipment

   a. Placing cylinders in a cart
   b. Fastening cylinders in a manner to prevent tipping over while using
   c. Removing the caps from cylinders
   d. Cracking the cylinder valves to blow out all dust and other foreign matter
   e. Using appropriate cloth to remove mud or dirt from the connections when feasible
   f. Preventing damages to clothes or body when setting up the equipment
   g. Replacing the iron cap on the cylinders when the regulator is removed
   h. Removing dust caps and connecting the acetylene regulator to the acetylene cylinder
   i. Connecting oxygen regulator to the oxygen cylinder
   j. Setting the regulator in an upright position with the gauges facing the front
   k. Attaching fittings to each end of the hoses
   l. Connecting the green and red hoses to the appropriate attachments
   m. Using appropriate procedures in closing regulator valves before opening the cylinder valves to prevent damage to the regulator
   n. Opening the oxygen cylinder valve as recommended by manufacturer
   o. Using appropriate procedures in opening the acetylene valve with the T-wrench
   p. Opening both valves on the torch to desired opening
   q. Screwing the oxygen regulator valve in the correct direction until desired pressure is reached on the oxygen low pressure gauge and closing the oxygen valve on the torches
   r. Screwing the acetylene regulator in the correct direction until desired pressure is reached on the acetylene low pressure gauge and closing the acetylene valve on the torch
   s. Testing for leakage by applying soapy water around the valves and connections

2. Starting various types of torches and cutting steel and cast iron

   a. Starting the oxy-acetylene torch

(1) Opening the acetylene valve on the torch for the desired opening
(2) Using correct techniques in lighting the tip with a friction lighter
(3) Opening the acetylene regulator valve on the tank until desired pressure is obtained
(4) Putting on goggles
(5) Opening the oxygen valve on the torch until the preheat flames are adjusted to a neutral point
(6) Controlling the oxygen pressure

b. Starting the oxy-propane torch

(1) Opening the main valve on the propane tank to the desired opening
(2) Opening the main valve on the oxygen tank
(3) Turning the propane-tank diaphragm until the gauge registers the desired amount of propane for the specific size of tip being used
(4) Turning the oxygen regulator until the gauge registers the desired amount for the specific size of tip being used
(5) Opening the propane control knob for desired opening
(6) Opening the oxygen control knob for desired opening
(7) Lighting the flame with a flint lighter
(8) Opening the oxygen control valve until the flame is pulled back to the tip and a neutral flame is obtained
(9) Making adjustments when the flame does not come back to the tip
(10) Turning the oxygen control knob until a neutral flame is obtained

c. Cutting steel

(1) Placing a piece of ½" flat iron over the edge of the table about 2"
(2) Making a mark about 1" from the end with a piece of soapstone
(3) Putting on goggles and gloves
(4) Lighting the torch
(5) Adjusting flame
(6) Selecting proper-sized tip and regulator pressure for different thicknesses of metal

(7) Using correct procedures in grasping the torch
(8) Using appropriate techniques in heating metal
(9) Cutting the metal
(10) Using a chisel and hammer to remove any remaining slag on the edge of the cut

d. Cuting Cast Iron

(1) Adjusting the torch to an excess acetylene flame
(2) Using correct procedures and techniques in preheating cast iron
(3) Using correct procedures and techniques in cutting cast iron

Examples of Supporting References:

1. Wakeman, T. J., and McCoy, Vernon Lee. The Farm Shop. New York: MacMillan Company 1960. 597 pages

2. Welding and Cutting Manual: How to Use Your Oxy-Acetylene Outfit. New York, New York: Division of Union Carbide Corporation, Linde Company, 1949, 208 pages

3. Phipps, Lloyd James: Farm Mechanics Text and Handbook. Danville, Illinois: The Interstate Printers and Publishers, Inc. 1964

Examples of Student Learning Activities:

1. While working in the shop, the instructor may have several students place oxy-acetylene cylinders in a cart and fasten the cylinders in a manner to prevent tipping over while in use.

2. The instructor may have several students prepare a soapy water solution and use the solution to test for leaks on the oxy-acetylene equipment.

3. The instructor may have each student in the class demonstrate the correct procedures in starting the oxy-acetylene torch.

4. Given the appropriate oxy-acetylene welding equipment and a piece of steel to be cut, the instructor may have each student cut the steel with the use of the oxy-acetylene equipment.

Examples of Evaluation Techniques:

1. Given the task of connecting the green and red hoses to the appropriate outlet connections on the torch, the student should be able to connect the hoses to the correct outlet connections on the torch so well that leaks are prevented and the connections are made according to manufacturer's directions.

2. Given access to oxy-acetylene equipment, the student should be able to light the torch with a flint lighter so well that the torch continues to burn and the student's body is not injured.

3. Given access to oxy-acetylene equipment, the student should be able to open the oxygen valve on the torch in a manner that the preheat flames are adjusted to a neutral point.

4. Given a chisel, hammer and a piece of steel recently cut with the oxy-acetylene equipment which has slag on the edge of the cut, the student should be able to remove the slag with the use of the chisel and hammer so well that the piece of steel cut fits its intended purpose.

Instructional Resources:

1. Different types of metals of varying thickness for the student to work on
2. A sufficient number of oxy-acetylene welders for number of students enrolled
3. Oxy-acetylene welding accessories including gloves, goggles, clamps, pliers, chisels, hammers, friction igniters, tip cleaners, welding tables, welding rods, and tips of various sizes for cuttings
4. Vises
5. Wire brushes
6. Charts showing tip sizes to use and pressure settings to use for various situations

Student Performane Objective 2:

Given various types of metals to be welded and the appropriate welding equipment, the student will perform fillet welds in various positions that when the following welding processes are completed

a. Welding with steel rods
b. Bronze welding
c. Welding cast iron
d. Hardsurfacing
e. Fusion welding without a rod

the metals welded will be of sufficient strength for the required operating conditions as determined by the instructor.

Instructional Areas:-

1. Welding with steel rods

   a. Practicing several basic tasks before welding with a steel rod

      (1) Placing metals on table which are to be welded with desired spacing
      (2) Putting on goggles
      (3) Lighting torch
      (4) Adjusting flame
      (5) Tacking welding joints
      (6) Heating metal to a molten temperature

   b. Using a steel rod in performing various types of butt welds in the flat position

      (1) Square butt weld
      (2) Single-vee butt weld
      (3) Double-vee butt weld

   c. Using a steel rod in performing single-vee butt welds in other positions

      (1) Making horizontal welds
      (2) Performing vertical welds
      (3) Performing overhead welds

   d. Using a steel rod in performing fillet welds in other positions

      (1) Lap welds
      (2) Tee-Joint welds

2. Bronze-Welding

   a. Preparing the metal for bronze welding

      (1) Cleaning metal by grinding with electric grinder
      (2) Brush with wire brush
      (3) Scraping with appropriate equipment
      (4) Tinning the metal by covering the surface to be welded with bronze

b. Bronze-welding in flat position
c. Bronze-welding in vertical position

3. Welding cast iron

   a. Using the bronze rod in welding cast iron in various positions
   b. Using a cast iron rod in welding cast iron in various positions

4. Hardsurfacing farm machinery

   a. Cleaning metal to be hardsurfaced by grinding, filing, or brushing with a wire brush
   b. Removing all grease, oil and other foreign matter with appropriate cleaning materials
   c. Placing metal to be hardsufaced in an appropriate location in a flat position
   d. Heating metal
   e. Adding enough rod to form a casting
   f. Removing slag

5. Fusion welding without a rod

   a. Placing metal on welding table in desired position
   b. Putting on goggles, lighting torch and adjusting flame
   c. Tacking metals together to prevent warping and spreading
   d. Fusing the metals
   e. Repeating the fusion process until weld is uniform in width and height

Examples of Supporting References:

Supporting References were depicted in Student Performance Objective 1.

Examples of Student Learning Activities:

1. Given access to gas welders, the instructor may have student light and adjust the flame on the gas welders.

2. Given access to gas welders and pieces of metals, the instructor may have students demonstrate the appropriate techniques of heating the metals.

3. Given access to gas welders, pieces of steel and rods, the instructor may have students demonstrate the techniques for performing a square butt weld in the flat position.

4. Given access to gas welders, pieces of metals and bronze rods, the instructor may have students weld metals together by using the given equipment and materials.

5. Given access to gas welders and pieces of cast iron, the instructor may have students heat the cast iron pieces until they are cherry red with the gas welder

6. Given access to gas welders, plow shares and appropriate rod, the instructor may have students hardsurface the plow shares with the gas welder and rod.

Examples of Evaluation Techniques:

1. Given access to gas welders, steel rods and pieces of metals, students should be able to square butt weld the metals in a flat position so well that they are able to withstand normal operating conditions.

2. Given access to gas welders and the task of bronze-welding pieces of farm machinery, the students should be able to select the correct bronze rods as recommended by the manufacturer.

3. Given access to gas welders, flux, cast iron rod and pieces of cast iron the students should be able to flat weld cast iron pieces so well that they are able to withstand normal operating conditions and is performed to the satisfaction of the instructor.

4. Given access to gas welders, plow shares and hardsurfacing rods, the students should be able to hardsurface the plowshares to the satisfaction of the instructor.

Instructional Resources:

1. Adequate number of gas welders for number of students enrolled
2. Pieces of flat iron of varying thickness
3. Various sizes of welding tips
4. Various sizes of steel rods
5. Electric grinder
6. Oxy-acetylene welding accessories including gloves, goggles, clamps, pliers, chisels, hammers, friction igniters, tip cleaners, welding tables, wire brushes
7. Charts showing tip sizes to use and pressure settings to use for various situations

8. Various sizes of bronze rods
9. Scrap pieces of cast iron
10. Flux
11. Plow shares

Student Performance Objective 3:

Given access to gas welding equipment, accessories and various types of metals to be welded or cut, the student will apply safety practices while performing various types of welds or cuttings which will prevent injury to the body, other workers or damage to the equipment as determined by the instructor.

Instructional Areas:

1. Protecting human bodies while cutting or welding
   a. Wearing proper nongreasy clothing without cuffs
   b. Wearing proper gloves
   c. Wearing appropriate goggles
   d. Keeping tip pointed away from body to prevent saturating clothes with gas before lighting
   e. Treating body and eyes with recommended solutions when needed
   f. Keeping the tip pointed away from body when lighting

2. Preventing explosions
   a. Checking for leaks daily with soapy water
   b. Keeping flame and heat away from tanks
   c. Opening valve on the acetylene tank no more than one full turn so that it can be closed quickly
   d. Keeping safety caps on tanks when regulators are not attached
   e. Subjecting hose to only the required pressure
   f. Using only hoses which are in good condition
   g. Keeping acetylene cylinder in upright position

3. Using care around combustible materials
   a. Cleaning shop of combustible materials frequently
   b. Covering containers of flammable materials or removing before welding
   c. Keeping flame away from flammable materials
   d. Laying down torch only after flame is out
   e. Placing hot metal in protected area
   f. Preventing using any kind of oil on any part of the welding equipment

g. Using safety practices in handling tanks

4. Protecting from gases and flames

   a. Ventilating shop properly when welding or cutting
   b. Utilizing forced ventilation when welding and cutting in confined areas

Examples of Supporting References:

Supporting references were shown in Student Performance Objective 1.

Examples of Student Learning Activities:

1. Given access to gas welding equipment and soapy water the instructor may have students check the equipment for leaks.

2. The instructor may desire to have several students clean the welding booths in the laboratory

3. The instructor may have several students demonstrate the proper techniques in wearing welding clothes, gloves and goggles.

Examples of Evaluation Techniques:

1. Given access to gas welders which are to be relocated, the students should be able to relocate the gas welders to the satisfaction of the instructor.

2. Given access to gas welders and torch igniters, students should be capable of lighting torches so well that the torches remain lighted without body injuries.

Instructional Resources:

1. Access to gas welders and shop
2. Oxy-acetylene welding accessories including gloves, goggles, friction igniters
3. Soapy water
4. Brooms and brushes for cleaning the shop laboratory
5. Containers for combustible materials

APPENDIX E

LISTING OF INDIVIDUALS WHO REVIEWED STUDENT TERMINAL PERFORMANCE OBJECTIVES AND INSTRUCTINAL MODULES

REVIEWERS OF STUDENT PERFORMANCE OBJECTIVES AND INSTRUCTIONAL MODULES

Name	Position, Address
Mr. Philip Carter	Instructor of Vocational Agriculture Shelby, Michigan
Dr. Raymond M. Clark	Consultant Michigan State University East Lansing, Michigan
Dr. Y.A. Demirjian	Director Muskegon County Wastewater Management System Muskegon, Michigan
Mr. Keith Griffin	Instructor of Vocational Agriculture Montague, Michigan
Mr. Richard Hopson	Chemistry Instructor Muskegon Community College Muskegon, Michigan
Mr. James Kane	Biology Instructor Muskegon Community College Muskegon, Michigan
Mr. Claude Premo	Biology Instructor Muskegon Community College Muskegon, Michigan
Mr. Michael Strazanac	Welding Instructor Muskegon Community College Muskegon, Michigan
Mr. Walter Weber	Instructor of Vocational Agriculture Ravenna, Michigan
Mr. Timothy Westman	Laboratory Director Muskegon County Wastewater Management System Muskegon, Michigan

APPENDIX F

AN EXPLANATION OF THE COMPONENTS IN THE INSTRUCTIONAL MODULES

COMPONENTS OF THE INSTRUCTIONAL MODULES

Each of the modules consist of the following components:

1. Module Concept
2. Prerequisites
3. Module Goal
4. Student Terminal Performance Objectives. Each Performance objective has these sections:
    a. Instructional Areas
    b. Examples of Supporting References
    c. Examples of Student Learning Activities
    d. Examples of Evaluation Techniques
    e. Instructional Resources

A Description of the Module Concept:

The module concept consists of a synopsis of the module material and what the student will be studying. It depicts the relevance of the subject material and explanations of why the student should study the material. The module concept particularly explains how the module is related to the student occupational program.

Prerequisites:

Prerequisites provide the teacher with information in regard to what the learner should know or be able to do before pursuing the module.

The Module Goal:

The Module Goal was written in a broad sense to indicate the competency of the student upon completion of a module.

Student Performance Objectives:

Student Performance Objectives are descriptions of intended outcomes which require the acquisition of certain knowledge and skills. Student performance objectives will be written to describe in detail various aspects of the module goal. Several student performance objectives will be written so that the student will be capable of performing the module goal effectively. The conditions (setting, objects, information or assistance) and acceptable level of performance will be established for each student performance objective. Each student performance objective will have the following elements:

1. Instructional Areas. Titles and subtitles of instructional areas will be written to define the relevant content that should be covered by the instructor.

2. Examples of Supporting References. Examples of supporting references will be included in the module to assist the instructor in accomplishing the desired performance of the student.

3. Examples of Student Learning Activities. Examples of student learning activities will be written so that the student may become actively involved in various activities that will assist him or her in achieving the student performance objectives.

4. Evaluation Techniques. Suggested evaluation techniques will be written to assist the student and/or instructor in determining how well the student can perform the student performance objective under specified conditions.

5. Instructional Resources. Instructional materials and/or equipment which are specific to the modules and essential to enhance the learning of students will be listed.

EVALUATION - MODULES BE REVIEWED, TESTED AND REVISED.

APPENDIX G

A LISTING OF INDUSTRIES AND AGENCIES WHO PROVIDED THE STAFF WITH RELATED PROJECT MATERIALS

INDUSTRIES

Allis - Chalmers
Milwaukee, Wisconsin

Aqua - Aerobic Systems
Rockford, Illinois

Briggs and Stratton Corporation
Milwaukee, Wisconsin

Chemineer Agitators Company
Dayton, Ohio

Ford Motor Company
Ford Tractor Division
Birmingham, Michigan

General Electric Company
Bloomington, Illinois

John Deere and Company
Moline, Illinois

Lockwood Corporation
Gering, Nebraska

Minneapolis - Moline
Hopkins, Minnesota

Oliver Corporation
South Bend, Indiana

Pennwalt Corporation
Belleville, New Jersey

White Farm Equipment Company
Charles City, Iowa

White Motor Corporation
Oak Brook, Illinois

GOVERNMENTAL AGENCIES

Michigan Department of Agriculture
Lansing, Michigan

Michigan Department of Public Health
Lansing, Michigan

Michigan State University Cooperative
Extension Service
East Lansing, Michigan

Michigan Department of Natural Resources
Lansing, Michigan

New York State Department of Health
Albany, New York

New York State Education Department
Albany, New York

Oklahoma State Department of Vocational
and Technical Education
Stilwater, Oklahoma

Oregon Department of Education
Salem, Oregon

Texas State Department of Health
Austin, Texas

United State Department of Agriculture
Washington, D.C.

United State Department of Health, Education,
and Welfare
Washington, D.C.

United States Department of Labor
Washington, D.C.

United States Environmental Protection Agency
Washington, D.C.

United States Office of Soil Conservation Service
Washington, D.C.

Water Pollution Control Federation
Washington, D.C.

COLLEGES AND UNIVERSITIES

Clemson University
Clemson, South Carolina

Michigan State University
East Lansing, Michigan

Montana State University
Bozeman, Montana

The Ohio State University
Columbus, Ohio

Sacramento State College
Sacramento, California

The University of Michigan
Ann Arbor, Michigan

APPENDIX H

BIBLIOGRAPHY OF DOCUMENTS REVIEWED AND USED FOR THE PROJECT

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APPENDIX I

MODULE REVIEW FORM

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

Module Review Form

Module Title _____

Reviewer's Name _____

Reviewer's Office Telephone Number _____

Directions for Reviewing Modules

The statements you are to review pertain to the components in the . We would like you to review each student performance objective independently in addition to the following elements, which are part of each student performance objective:

a. Instructional Areas
b. Examples of Student Learning Activities
c. Examples of Evaluation Techniques
d. Instructional Resources

If you determine that the student performance objective and each of the above four elements measures up to the criteria as stated, place a check mark (✓) in the yes margin. Whenever you determine that the student performance objective or any of the four elements does not measure up to the criteria described, place a check mark (✓) in the no margin.

Whenever a no is checked, please identify and define the nature of the problem by writing down the problem under the appropriate heading and space provided.

STUDENT PERFORMANCE OBJECTIVE CRITERIA

The objective is stated so that it is clear what performance is expected of the student, the level of performance expected, and under what conditions the performance is expected.

YES NO

___ ___ #1 STUDENT PERFORMANCE OBJECTIVE

Nature of the problem

_____

_____

_____

_____

INSTRUCTION AREAS CRITERIA
The content is composed of topics defining areas of study directly related to the achievements of the objectives and is a consistent format and style appropriate to aiding development of meaningful lesson plans.

YES	NO	Outline Number and Letter	Nature of the problem
___	___	_____	_____
		_____	_____
		_____	_____
		_____	_____

EXAMPLES OF STUDENT LEARNING ACTIVITIES CRITERIA
The student activities are appropriate examples of how a student may be involved in learning activities that will will achieve the objective in a realistic manner.

		Activity Number	Nature of the problem
___	___	_____	_____
		_____	_____
		_____	_____

EXAMPLES OF EVALUATION TECHNIQUES CRITERIA
The student evaluation examples define appropriate measures to determine how well the student can accomplish the stated objectives. The evaluation examples define means for assessing the application of knowledge.

		Item Number	Nature of the problem
___	___	_____	_____
		_____	_____
		_____	_____

INSTRUCTIONAL RESOURCES CRITERIA
The instructional resources are those which can be provided to the student in the educational setting or supervised work experience to help the student achieve the objectives and to prepare the student for the type of materials or equipment used in

in the occupation.

YES NO

___ ___ Item Number _____ Nature of the problem _____

_____ _____

_____ _____

___ ___ #2 STUDENT PERFORMANCE OBJECTIVE

Nature of the problem _____

_____

_____

INSTRUCTIONAL AREAS

___ ___ Outline Number and Letter Nature of the problem _____

_____

_____

EXAMPLES OF STUDENT LEARNING ACTIVITIES

___ ___ Activity Number _____ Nature of the problem _____

_____ _____

_____ _____

EXAMPLES OF EVALUATION TECHNIQUES

___ ___ Item Number _____ Nature of the problem _____

_____ _____

_____ _____

INSTRUCTIONAL RESOURCES

___ ___ Item Number _____ Nature of the problem _____

_____ _____

_____ _____

APPENDIX J

SURVEY QUESTIONS CONCERNING USING THE
MUSKEGON WASTEWATER MANAGEMENT SYSTEM
AS AN "EDUCATIONAL TOOL"
AND THE RESULTS OF THE SURVEY

The Survey Questions

Given the continual need to search out educational opportunities and a unique wastewater system, the questionnaire is attempting to seek out possibilities for using the Muskegon Wastewater System (MWWS) as an opportunity for the educational community. There are presently vocational agriculture programs and farms at Shelby, Ravenna and Montague.

1. Given several good existing vocational programs in agriculture as well as in farm and automotive mechanics, could the MWWS be used as an opportunity to enhance those programs by offering training beyond the programs; example. working with farm equipment not available in present programs, and in addition, offer opportunities for students in the Muskegon area who cannot attend the existing programs because of the distance from Muskegon?

2. Given few opportunities of Michigan residents to study wastewater treatment systems and management in the state, could the MWWS be used through educational institutions such as area community colleges to train wastewater treatment operators in land treatment of wastewater?

3. Given three vocational agricultural programs with farms, could the facilities at the MWWS enhance those existing farms in serving as educational tools for the vocational programs by providing different farm experiences beyond what the present farms offer?

4. Given the distance to the existing vocational agriculture farms from Muskegon, do possibilities exist for using the MWWS as an outdoors laboratory for the use of classroom teachers in the Muskegon area?

5. If the county, or a group of local interests in cooperation with the county, develop a visitors' center to enable residents and visitors to Muskegon to visit the MWWS (a matter which has been much discussed), are there possibilities of using the visitors' center to train students in "people contact" jobs?

6. Acknowledging that the MWWS is unique in the nation and much interest exists by persons worldwide in seeing and studying the system, could the system provide enough interest nationwide and worldwide for an environmental studies center for seminars and conferences on a variety of topics relating to wastewater management and the environment?

7. Given the interest of Boy Scouts, Girl Scouts, the 4-H and many other organizations in the environment, nature and agriculture, are there ways such groups could utilize the MWWS in their educational programs?

8. With recreation and conservation important concerns today, are there ways the MWWS could provide educational possibilities in wildlife management, conservation management and recreational opportunities for the people of the Muskegon area?

9. Given many local persons interested in gardening, ornamental horticulture and environmental studies, are there possibilities at the MWWS for such adult enrichment programs?

10. Given the need for implementing new agricultural programs in Muskegon County, is there a possibility of securing needed land from the county and constructing buildings on the site in order to prepare individuals for agricultural careers?

11. Do you have any suggestions on the use of MWWS as an educational opportunity?

VOCATIONAL AND TECHNICAL AGRICULTURE RESEARCH PROJECT

13 Interviews
17 persons
10 Mainly followed questions

Participants in Survey:

1. Mr. Charles Raap - Former County Commissioner
2. Mr. Keith Griffin - Vo. Ag. Teacher, Montague
3. Mr. Phil Carter - Vo. Ag. Teacher, Shelby
4. Mr. Frank Lehman - Trustee, Montague Board of Education
5. Mr. Walter Weber - Vo. Ag. Teacher, Ravenna
6. Mr. Donald Nutt - County Commissioner, Muskegon County
7. Mr. Thomas Hoogerhyde - Chief, Municipal Wastewater Division, Michigan Department of Natural Resources (telephone Conversation)
8. Mr. George Townsend - Superintendent of Ravenna Public Schools
9. Mr. Dave Marsh - Farm Manager, Muskegon County Wastewater Management System
10. Mr. Harold Ferris - Director, MSU Agricultural Extension Service, Muskegon County
11. Mr. Jack Parker - Extension 4H - Youth Agent
12. Mr. Steve Marotti - Horticulture Program Assistant, County Extension Service
13. Dr. James W. Perry - Assistant Superintendent, Instruction, Muskegon Public School District
14. Mr. Bob Zettle - Director, Muskegon County Department of Public Works
15. Dr. Demirjian - Manager, Muskegon County Wastewater Management System
16. Dr. Michael Schafer - Dean of Instruction, Muskegon Community College
17. Mr. Richard Karelse - Specialist, Secondary Unit Department of Education, Vocatonal Education and Career Development Service, Lansing

Results of the Survey

Questions #1 and #3 Given Present Vo-Ag Programs:	How to Enhance at MWWS?
1. New Agricultural Programs	7
2. Field Trips	6
3. Outdoor Lab	4
Horticulture	
4. Agricultural Mechanics	3
Recreation	
5. Farm Equipment Operations	2
Irrigation Training	
Landscaping	
Forestry	
Sheep Projects	
6. Soil Management	1
Conservation Studies	
Wildlife Studies	
Farm Management	
Cropping Management	
Independent Study	
Variety Corn Plots	
Resource Persons on Site	
Class Work	
Land Clearing	
Fence Building	
Soil Testing	
On the Job Training	
Nursery Products	

Some Problems: Distance

Cost of new buildings on the site in Vocational-Technical Programs

Health Department acceptance of students on the site

Question #2 Wastewater Treatment Operator and Management Training

Yes	3
No	0

Problems: Site does not include conventional operations

Question #4 Outdoors Lab for classroom teachers

Yes	6
No	0

Question #5 Visitors Center

with students	5
Center	4
Nature Center	1

Problems: Who will pay for the educational opportunities provided?

Question #6 Seminars and Conferences

Yes	5
No	1
Planning One	1

Problems: Who will pay?

Question #7 Boy Scouts, Girl Scouts, 4-H

Yes	4
No	0

Question #8 Wildlife Management, Conservation Management and Recreational Opportunities

Yes	9
No	0
Wildlife Management	8
Conservation	4
Recreation	4

Problems: Persons misusing the land
Difficult to control hunting
Possible interference with wastewater treatment and farm operation

Question #9 Community Gardens

Yes	4
No	4

Problems: Administration
Theft of garden produce
Water from outside the system
Distance from town, transportation

Question #10 Land for Buildings on site: (Vo-Tech program)

Yes	7
No	0
Some Suggestions: Use Empty Barns	2

Problems: Possible Health Department objection
Who will finance?

Question #11 Other Suggestions

Sheep raising
Public relations program
Controlled hunting
Variety plots of corn
Farm diversification
Nature Center

Coordination of several programs
Hydroponics experimentation

Some Possibilities:

1. Agri-business courses
2. Consumers' economic studies
3. Courses on the complexity of getting the food produced on the farm and to the consumer
4. Environmental Protection Studies
5. Environmental Studies
6. Vo-Tech center
7. Horticulture and landscaping program
8. Wildlife management, conservation and recreation programs
9. Visitors' Center for training students in "people contact" occupations
10. Nature Center
*11. Wastewater Treatment Operator's technical course
*12. Wastewater Treatment Laboratory Technician course
13. Forest Management programs

* MCC has formulated some planning concerning technical courses and one proposal has been written.

APPENDIX K

USING THE MUSKEGON COUNTY WASTEWATER TREATMENT SYSTEM
AS A SPECIAL TRAINING FACILITY
AN IDEA SHEET

USING THE MUSKEGON COUNTY WASTEWATER TREATMENT SYSTEM
AS A SPECIAL TRAINING FACILTIY

AN IDEA SHEET

Background:

Muskegon County has a great need to generate employment, especially amoung young adults. In addition, the economic condition of Muskegon County has room for improvement. As examples: Muskegon County has the lowest family income in Michigan, it is first in the percent of families below the poverty level and it is last in percent of families earning $15,000 a year or more.

In education Muskegon County is lowest of all Michigan Standard Metropolitan Statistical Areas (SMSAs) in median school years completed by persons 25 and over and percent of persons completing at least four years of high school. There is a need for increased educational facilities to help turn these statistics around. Statistics represent people, people who have the potential to improve themselves given the opportunity. The need is especially crucial for graduating high school students and high school dropouts.

The Muskegon Area Intermediate School District serves the following 12 District high schools in and around Muskegon County:

Fruitport
Holton
Mona Shores
Montague
Muskegon
Muskegon Heights
North Muskegon
Oakridge
Orchard View
Ravenna
Reeths-Puffer
Whitehall

There are also Muskegon Catholic Central High School and Western Michigan Christian High School serving the area. The County Wastewater Management System No. 1 has a limited potential for creating jobs directly. It has a great potential for creating jobs by encouraging industry to both move in and expand in the County.

The MWWS has already dramatically improved Muskegon Lake. It has, further, encourged new industry to take a look at Muskegon as a possible site of operations. The MWWS also represents an 11,000 acre county operated farm. In agriculture and related fields the area is served by Muskegon Community College, Michigan State University through its Co-operative Extension Service, the Soil Conservation Service and many other branches of local and federal government.

EXISTING PROGRAMS AND PLANS FOR FUTURE PROGRAMS

Muskegon Community College

Presently has courses in:

Automotive technology
Cast metals technology
Electronics technology
Machine technology
Graphic Reproduction technology
Apprenticeship training in the Building and Machine trades
Industrial/Manufacturing technology Allied Field
Radio and T.V. repair
Agribusiness program (no agricultural economics included)

Expansion plans:

Development of agri-business courses

Montague

Presently has courses in:

Horticulture	20 students
Agricultural mechanics 2 hour course	34 students
Animal science	34 students

Recently completed an agricultural mechanics building

Expansion plans:

Develop Agricultural mechanics
Develop plant and animal sciences

Ravenna

Presently has courses in:

Plant Science/Animal Science	25 students
Agricultural mechanics	17 students
Farm Management	23 students
Forestry/Landscaping	15 students

Shelby

Presently has courses in

One semster	Agricultural Production	13 students
One semster	Ornamental horticulture	20 students
One semster	Forestry	19 students
	Farm Management I	28 students
	Farm Management II	13 students

Has a 120 acre farm, mainly orchard

Expansion plans:

Develop the 120 acre farm
Go into basic animal sciences

IDEA SHEET

1. The Muskegon County Wastewater Treatment System Number 1 has the potential for serving as a vocational training center in:

   a. Agricultural equipment mechanics
   b. Wastewater treatment operators
   c. Farm Management
   d. Field Supervisors
   e. Farm Equipment Operators
   f. Irrigators
   g. Grain Drier Operators

   These vocational interests go beyond the present area vocational agricultural programs and would serve to support such programs as well as open up a variety of agricultural occupations to students in the south part of MAISD, many who do not presently have the opportunity to study agriculturally related occupations.

2. The Muskegon County Wastewater Treatment System Number 1 has a tremendous potential for serving as an outdoors laboratory for the teachers of the constituent school districts for kindergarten through grade 12. The system could serve as the focus for field trips and studies on growing things, conservation, wildlife, visiting a farm, visiting a wastewater treatment system, environmental studies and many other interests. The present vocational agricultural programs could use the system to enhance their agriculturally related subject matter. Grade school children might be brought in not only to see, but to do. Classes might visit the system and plant seeds on a perarranged site with follow-up visits and harvesting of the crops.

3. A visitor's tour center would be a service to the county as well as provide training for persons desiring "people contact" oriented job experience. A recent study by Muskegon Community College indicated that 78% of the people interviewed in Muskegon County wanted to visit the wastewater treatment site. There are a number of indications that some type of visitor center will be required to handle the many requests for visits to a system that is gaining a great deal of public discussion and interest. By using the visitor's center as an educational tool, both the county and the school districts would be well-served.

4. There is an increasing need to have some type of conference and seminar center where people world-wide may come to study land use in wastewater treatment. Nearly 1500 dignitaries and staff have already visited the system. With increasing environmental concerns and efforts to reach the 1985 water standards, the Muskegon area could very well become a well-known center of studies on environmental technology.

With new land treatment systems being considered around the world there is also a specialized need to provide a center where people could come to receive training and information for several purposes: As Examples:

a. People coming to gain enough information to help communities determine the possibilities of land treatment of wastewater for their communities.

b. Persons who are assigned the task of selling a wastewater land treatment system to their communities.

c. Persons from systems that must upgrade to meet the increasing standards exploring various alternatives and possible changes.

d. Environmentalist who may come to observe what is being done in meeting increasingly high standards for wastewater treatment systems.

e. Governmental agencies which periodically hold conferences and seminars relating to environmental protection, wastewater treatment and related fields.

5. Much research has been done and much remains to be done in the use of wastewater in crop production. The system could very well provide on-going facilities for research in such areas as:

a. New crops
b. Uses of wastewater on various plants and flowers
c. Seed production with wastewater
d. Bee keeping
e. Soil experiments using wastewater
f. Conservation methods
g. Wild-life studies, expecially the water fowl and their changing flight patterns in light of facilities such as in Muskegon
h. Vocational education research using a variety of facilities, shared-time programs and various specialized curriculum in vocational education

6. Enrichment programs especially designed for senior citizens that are held during the daytime and would provide interest groups in ornamental horticulture, vegetable gardening, flower gardening and the green house growing of plants. An area of the system not reached by irrigation rigs might be set aside where senior citizens could actually maintain their own garden plots and grow vegetables and flowers. Green house facilities would provide year-around interest groups.

7. Enrichment programs in the evening for all adults interested in ornamental horticulture, vegetable gardening, flower gardening, and green house production of plants. Classes could be held during which adults could actually grow their own flowers for Christmas, Easter and other special days. Enrichment programs

in environmental studies could also be popular and helpful to the community in communicating what Muskegon County is doing in the area of environmental protection.

8. The Muskegon County Wastewater Treatment System Number 1 could serve as a useful center to which Boy Scouts, 4-H and FFA groups could visit for a variety of educational and awareness type activities in environmental sciences and technology, conservation, wild-life, hiking and agriculturally related interests such as farming.

9. The Muskegon County Wastewater System No. 2 (near Whitehall - Montague) could serve the local school district and vocational agricultural programs as an outdoors laboratory and serve as a useful center which Boy Scouts, 4-H, FFA and Girl Scouts could visit for a variety of educational and awareness type activities.

APPENDIX L

A DISCUSSION OF POSSIBILITIES AND APPROACHES FOR IMPLEMENTING VOCATIONAL AND TECHNICAL AGRICULTURAL PROGRAMS IN CEPD #21

A DISCUSSION OF POSSIBILITIES AND APPROACHES FOR IMPLEMENTING VOCATIONAL AND TECHNICAL AGRICULTURAL PROGRAMS IN CEPD # 21

PREPARED BY THE MAISD VOCATIONAL
AND TECHNICAL AGRICULTURAL RESEARCH STAFF

FOR A MEETING WITH REPRESENTATIVES FROM:

MUSKEGON COMMUNITY COLLEGE

MICHIGAN DEPARTMENT OF EDUCATION

MICHIGAN STATE UNIVERSITY

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

OCTOBER 14, 1975

MUSKEGON COMMUNITY COLLEGE
MUSKEGON, MICHIGAN

THE FINAL REPORT

The final report for the MAISD Vocational and Technical Agricultural Research Project will consist of four (4) volumes. A brief description of the content to be included in each volume is as follows:

Volume I - An overview of the research project

a. Summary of the report
b. Problem area toward which the project is directed
c. Goals and objectives of the research project
d. Description of project procedures and accomplishments
e. Conclusions, Implications, and Recommendations for the future
f. Appendix and supplementary materials

Volume II - Task Analysis Results (The identification of required job skills, knowledges, behaviors, and basic skills for each occupation studied)

a. Wastewater Treatment Operator
b. Farm Manager
c. Irrigator
d. Agricultural Equipment Mechanic
e. Field Supervisor
f. Grain Drier Operator
g. Wastewater Treatment Laboratory Technician
h. Farm Equipment Operator

Volume III - A useable instructional delivery system for preparing students at the secondary and post-secondary levels for agricultural careers

a. A complete set of student terminal performance objectives for the eight agricultural occupations studied
b. Instructional modules for training wastewater treatment operators (conventional and land treatment systems)
c. Examples of how instructional modules can be developed for other occupations studied

Volume IV - Audio-visual materials to inform students of the many occupational opportunities available to them in the broad field of agriculture

a. A filmstrip with narrative cassette tape will be produced to explain the development, construction, and operation of the Muskegon County Wastewater Management System. The thrust of this filmstrip will be directed at the role of individuals working in the agricultural occupations studied.

b. A second filmstrip with narrative cassette tape will be developed to inform students of the many careers available in agriculture. Information relative to training programs is also included in the filmstrip.

BASIC FINDINGS

A. AGRICULTURAL EMPLOYMENT NEEDS IN MICHIGAN, 1975-1979 PROJECTIONS

DR. WILLIAM THUEMMEL AND OTHERS AT MICHIGAN STATE UNIVERSITY RECENTLY COMPLETED A STUDY WHICH INCLUDED A PROJECTION OF AGRICULTURAL MANPOWER NEEDS IN MICHIGAN FOR 1975 THROUGH 1979. A CONSERVATIVE ESTIMATE OF AGRICULTURAL MANPOWER NEEDS IN MICHIGAN FOR A FIVE YEAR PERIOD IS SHOWN ON THE NEXT PAGE.

PROJECTED ANNUAL MANPOWER NEEDS IN MICHIGAN AGRICULTURE BY U.S.O.E. PROGRAM AREAS, 1975-1979

Program Area		1974 Employment Needing Agr. Knowledge and Skill	Ave. No. Additional F-T Workers Annually	Ave. No. Replacements Annually	Total Additional F-T and Replacements
01.01	Ag. Production	45,000	2,000[b]	1,557[c]	3,557
01.02	Ag. Supplies/ Services	9,692[a]	NA	335[c]	335
01.03	Ag. Mechanics	1,991 (Farm Implement Repair)	236	283	519
01.04	Ag. Products	11,815[a]	NA	409[c]	409
01.05	Orn. Horticulture (exc. retail florists)	10,073	1,067	720	1,787
01.06	Ag. Resources	284[a]	NA	10[c]	10
01.07	Forestry	4,188[a]	NA	145[c]	145
01.99	Ag., Other	7,941	NA	275[c]	275
	TOTAL	90,984	3,303	3,374	7,037

[a] Based on 1970 census data

[b] Based on projected labor force of 55,000 private and self-employed farm operators and workers by 1979

[c] Based on MESC statewide average employee replacement rate of 3.45% per annum

[d] Includes Retail Florists & Other Ag. Prod.

Source: Table 13, Thuemmel Report

B. EMPLOYMENT NEEDS AS A RESULT OF THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM

RECENT STUDIES INDICATE THAT THE EMPLOYMENT OF INDIVIDUALS WORKING IN CONVENTIAL WASTEWATER TREATMENT SYSTEMS AS WELL AS MODERN SYSTEMS IS EXPECTED TO RISE RAPIDLY THROUGH THE MID-1980's.

TREATING WASTEWATER BY MEANS OF LAND TREATMENT HAS RECEIVED MUCH PUBLICITY AND SUPPORT IN RECENT MONTHS. ENVIRONMENTAL PROTECTION AGENCY ADMINISTRATOR, RUSSEL E. TRAIN, PUBLICLY ENDORSED THE LAND TREATMENT APPROACH FOR THE FIRST TIME IN LATE APRIL, 1975. MORE THAN 100 RESEARCH EXPERTS FROM STATE AND FEDERAL AGENCIES AND PRIVATE ENGINEERING CONSULTING FIRMS RECENTLY CRITIQUED THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM. THE RESEARCHERS GENERALLY AGREED THAT THE MUSKEGON PROJECT IS THE BEST WASTEWATER MANAGEMENT SYSTEM IN THE NATION AND PROBABLY IN THE WORLD. THIS METHOD OF TREATING WASTEWATER SHOULD INCREASE THE DEMAND FOR THE TYPE OF AGRICULTURAL OCCUPATIONS STUDIED IN THE MAISD RESEARCH PROJECT.

C. STUDENT INTEREST IN CAREERS IN AGRICULTURE

THE VOCATIONAL EDUCATION DEPARTMENT IN THE MAISD ORGANIZATION SURVEYED APPROXIMATELY 6,000 TENTH AND ELEVENTH GRADE STUDENTS IN CEPD #21(14 SCHOOL DISTRICTS) TO DETERMINE THEIR VOCATIONAL INTEREST. THE INTEREST OF STUDENTS IN AGRICULTURE IN CEPD #21 IS SHOWN ON THE NEXT PAGE.

STUDENT INTEREST IN CAREERS
IN AGRICULTURE
FALL, 1974

Student interest in agriculture -- 10th and 11th Grade Students (Approximately 6,000 students were given the opportunity to select from all of the vocational course offerings in CEPD #21)

Muskegon Area Intermediate School District

"All courses are designed for both students who plan to apply for jobs immediately after graduation and for those who wish to further their careers by entering college."

"If all courses listed are made available to you, in which two (2) would you enroll?"

First Choice

Agriculture	South	North	Total
Production	93	28	121
Supplies	11	3	14
Mechanics	17	7	24
Products	24	5	29
Orn Hort	48	18	66
Total	193	61	254 (4%)

Second Choice

Agriculture			
Production	78	18	96
Supplies	30	4	34
Mechanics	20	8	28
Products	31	5	36
Orn Hort	67	17	84
Total	226	52	278 (5%)

D. THERE IS A NEED FOR MORE SPECIALIZED VOCATIONAL AGRICULTURAL PROGRAMS AT THE SECONDARY LEVEL IN CEPD #21. THE FOLLOWING LOCATIONS HAVE BEEN MENTIONED IN REGARD TO THIS NEED:

1. THE WASTEWATER SITE
2. USE BUILDING WHICH MAY NOT BE NEEDED BY THE SCHOOLS IN THE FUTURE (DECLINING ENROLLMENTS)
3. MUSKEGON COMMUNITY COLLEGE
4. PROGRAMS TO BE EMPHASIZED
   a. PRODUCTION AGRICULTURE
   b. ORNAMENTAL HORTICULTURE
   c. AGRICULTURAL SUPPLIES AND SERVICES
   d. AGRICULTURAL MECHANICS

E. THERE IS A NEED FOR TECHNICAL AGRICULTURAL PROGRAMS IN THE AREA. PROGRAM AREAS WHICH SHOULD BE GIVEN ATTENTION AREA AS FOLLOWS:

1. ENVIRONMENTAL PROTECTION (WASTEWATER TREATMENT OPERATORS AND LABORATORY TECHNICIANS)

2. FARM MANAGEMENT (AN EXTENSION OF PRODUCTION AGRICULTURE)

3. AN EXTENSION OF ORNAMENTAL HORTICULTURE
   a. LANDSCAPE DESIGN
   b. TURF MANAGEMENT
   c. SOIL MANAGEMENT

F. OFFICIALS AT THE WASTEWATER SITE AND COUNTY COMMISSIONERS ARE INTERESTED IN THE EFFORTS OF THE MAISD RESEARCH PROJECT.

G. ADMINISTRATORS FROM SEVERAL SCHOOL DISTRICTS IN CEPD #21, PLUS STATE DEPARTMENT AND MSU STAFF HAVE INDICATED THE NEED FOR MORE SPECIALIZED SECONDARY VOCATIONAL AGRICULTURAL PROGRAMS AND THE IMPLEMENTATION OF TECHNICAL AGRICULTURAL PROGRAMS IN THE MUSKEGON COUNTY AREA.

RECOMMENDATIONS

WE RECOMMEND THE DEVELOPMENT AND IMPLEMENTATION OF EDUCATIONAL OPPORTUNITIES THAT WOULD PROVIDE RELEVANT TRAINING IN AGRIBUSINESS, NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION (ANREP) FOR PEOPLE IN CEPD #21. THE CHART ON THE NEXT PAGE ILLUSTRATES THE FLOW OF EDUCATIONAL OPPORTUNITIES IN ANREP WE ARE PROPOSING

K-6 - AWARENESS IN ANREP

7-8 (9) - CAREER ORIENTATION IN ANREP

9-10 - CAREER EXPLORATION IN ANREP

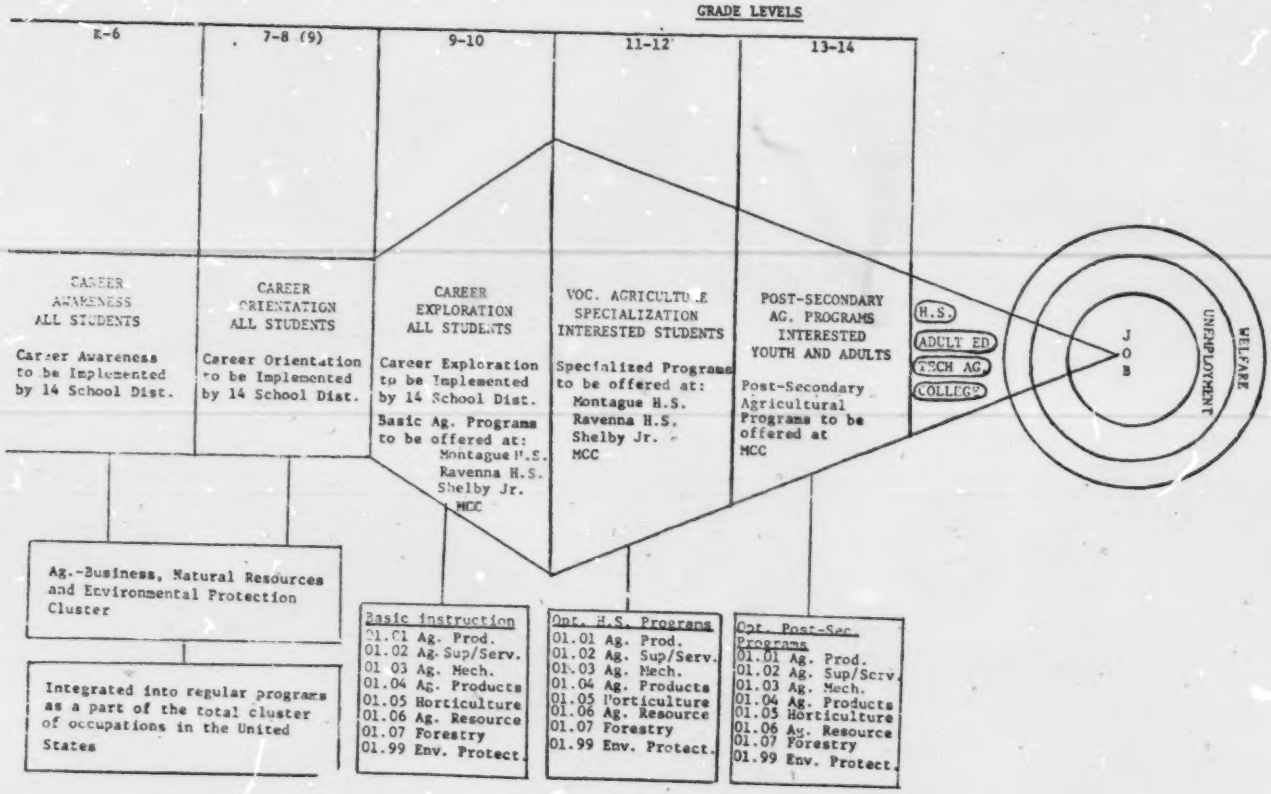
11-12 - (VOCATIONAL AGRICULTURE) PREPARATION IN ANREP

13-14 - (TECHNICAL AGRICULTURE) PREPARATION IN ANREP

ADULT EDUCATION - UPGRADING AND RE-TRAINING IN ANREP

MUSKEGON AREA INTERMEDIATE SCHOOL DISTRICT

EXPANDING AND IMPLEMENTING AGRICULTURAL PROGRAMS IN MUSKEGON COUNTY-A LONG-RANGE APPROACH



THE CHALLENGE

A. CAN MUSKEGON COUNTY BE THE MODEL FOR A STATEWIDE EFFORT TO:

   1. REDESIGN AND MODERNIZE THE VOCATIONAL AGRICULTURE CURRICULUM AT THE SECONDARY LEVEL

   2. PROVIDE AGRICULTURAL PROGRAMS FOR STUDENTS AT THE SECONDARY AND POST-SECONDARY LEVELS (FLOW OF EDUCATIONAL OPPORTUNITIES FROM HIGH SCHOOL TO THE COMMUNITY COLLEGE)

B. CAN WE GAIN COMMITMENT FROM MCC TO DESIRE AND AGREE TO DEVELOP TECHNICAL AGRICULTURAL PROGRAMS ARTICULATED WITH AN EXPANDED AND REDESIGNED SECONDARY VOCATIONAL AGRICULTURE PROGRAM?

C. CAN WE DEVELOP A COOPERATIVE APPROACH TO USE THE FACILITIES OF MCC AND THE SECONDARY SCHOOLS (PRESENT AND FUTURE), AND THE COUNTY PROPERTY AT THE WASTEWATER SITE FOR JOINT PROGRAMMING?

D. CAN WE SECURE A FINANCIAL GRANT FROM MICHIGAN'S DEPARTMENT OF EDUCATION TO ALLOW US TO MAINTAIN PERSONNEL TO DEVELOP AND IMPLEMENT ARTICULATED VOCATIONAL AND TECHNICAL AGRICULTURE PROGRAMS IN MUSKEGON COUNTY?

APPROXIMATE FINANCIAL NEED FOR ONE-YEAR - $55,000

A. WILL MCC PROVIDE THE FOLLOWING FOR ONE (1) STAFF? -- $5,000

1. TYPIST
2. OFFICE SPACE
3. MILEAGE
4. SUPPLIES
5. OTHER STAFF TIME

B. WILL MAISD PROVIDE THE FOLLOWING FOR ONE (1) STAFF? -- $5,000

1. OFFICE SPACE
2. OTHER STAFF TIME
3. TYPIST
4. MILEAGE
5. SUPPLIES

C. WILL THE COUNTY PROVIDE THE FOLLOWING? -- $5,000

1. USE OF LAND
2. FACILITIES (INCLUDING IMPROVEMENTS)

D. WILL THE STATE DEPARTMENT OF EDUCATION (VTES) PROVIDE A GRANT OF $40,000 TO PROVIDE SALARY MONIES FOR THE TWO STAFF PERSONS?

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APPENDIX M

A Proposal for a new
Agricultural Education Program
at the Muskegon System to be
known as "The Muskegon
County Environmental Studies
Center."

Proposal For A New Agricultural Education Program at the Muskegon System to be known as "The Muskegon County Environmental Studies Center."

1. Objectives and need for this assistance:

The Muskegon County Wastewater Treatment System presents some worthwhile opportunities for educational experiences related to the real world of work. The system is in full operation and contains the largest single farm under cultivation in the State of Michigan. The objective of this proposal is to develop a production vocational agricultural program and make student contact opportunities available on the site. This combination would provide some real-life work experiences for secondary students and provide a valuable service to the county by helping with the flow of visitors.

Several agencies need to be involved to help such a program accomplish it's stated goals. The Intermediate School District, Muskegon Community College, the Constituent School Districts, County Governmental Agencies and the Wastewater Treatment Site personnel participating in this project would produce meaningful cooperation for providing effective educational experiences for the people in the area.

A broad based program could include studies in Conservation, Environmental Studies, Horticulture, and Production Agriculture in addition to operating a seasonal visitor's center.

2. Results or benefits expected:

A. This project will provide hands-on training for students in subjects which will prepare them for working in the real world in some of the agricultural occupations in which there is a need for additional people in the State of Michigan.

B. This project will also answer a county need to provide visitor's facilities on the Wastewater Treatment Site while giving students "people contact" opportunities in the world of work. The DECCA Club of Muskegon Community College could be involved in the operation of the Visitor's Center.

C. This project will afford students an opportunity to be involved in developing and producing informational material for visitors and designing and building a model of the wastewater land treatment project for the visitor's introduction before touring the site. The model may have lights to show the movement of water through the system or a working model. The DECCA Club at Muskegon Community College could make a very worthy contribution in the project by producing materials.

D. Cooperation of several institutions in an educational venture can result in meaningful programs.

E. Direct benefits to Muskegon County:

1. Visitor's Center

2. Landscaping of the wastewater site and other county buildings by ornamental horticulture classes

3. Approach:

A. Plan of Action

There is an ideal area on the Muskegon Wastewater Treatment Site for a visitor's and vocational agriculture center. The most desirable area is more than one mile from the sprinkler rigs and lies on Apple Avenue for easy excess. Two barns in good condition are on the suggested site. There will be a minimum use of wastewater equipment and personnel. The equipment will be purchased and maintained by school personnel.

Phase I

It is suggested that the project begin with students preparing one barn for a visitor's center to the Wastewater Treatment System. This will involve painting, repairing doors and windows, general clean up and putting in some partitions in the barn.

Phase II

When the tourist visitor's center is operating the second phase would involve the development of a 1920 farm as an added tourist attraction, in contrast to visiting the largest farm in Michigan which is on the Wastewater Treatment Site.

Phase III

The next phase will be to develop a production vocational agricultural setting where students would operate the 1920 farm, including both the raising of crops and livestock. The suggested barn is in good condition and would require minimum repairs. However, fencing and gates are necessary.

Phase IV

The next phase will be to develop a year-around vocational agriculture program with Conservation, Forestry, Environmental Studies, Horticulture, and Landscaping taught at the schools during the winter months.

4. Unusual Features of the Project.

The suggested programs would provide some very good work and vocational experiences on the largest farm in Michigan and the largest land treatment wastewater system in the world. The visitor's center would be self-supporting

after an initial start-up expense and the students would have an excellent opportunity in "people contact" work experiences as well as receiving studies in the operation of the land treatment system.

5. Suggested time schedule:

18 weeks	Jan 20 - June 7	Operation of visitor's center Planting crops and purchasing animals
9 weeks	June 7 - Sept 1	Operation of visitor's center Summer Vocational Program Operation of Farm
18 weeks	Sept 1 - Jan 19	Close-up of Farm Visitor's Center Harvest Crops Sell Animals
	Nov 15 - Mar 1	Vocational Studies in the respective schools on a shared-time basis

6. Community Involvement

A unique feature of this proposal is the involvement of several educational units, governmental units and private enterprise in providing meaningful educational experiences and needed services for the county.

7. Availability of Vocational Programs to School Districts where no such opportunities now exist.

A survey by the Muskegon Area Intermediate School District determined that students are interested in agricultural occupations in schools where no agricultural training is presently available. Happily, the occupations the students are interested in are occupations for which a recent research project at Michigan State University has indicated there is a shortage of people entering each year. Under present state guidelines one school district would have to be selected to operate, employ staff, purchase supplies, and bill the co-operating districts and agencies for their share of the cost. (If an area millage was passed, the Intermediate District could be selected to operate the project. Area millage would also reduce the amount of funds to be raised).

However, Ravenna, because of a long history of successful vocational agricultural programs, would be an excellent operator of the project. Ravenna is near the suggested site on the Wastewater Land Treatment Site and has the expertise among it's personnel to administer the project.